

horizontally along the slabline and the central stabs inside the resonant probes perpendicularly to the slabline.

Claim 15 (new):

An electro-mechanical tuner, comprising a slotted airline, a test port and an idle port is divided in to three sections, each section comprising a mobile carriage, which comprises a resonant probe, inside of which there is a central open-ended stub, which is capacitively coupled with the central conductor of said airline, said tuner is calibrated by measuring scattering parameters (S-parameters) between the test and idle ports at a given frequency (f_0) and its two harmonics ($2f_0$ and $3f_0$), as a function of the horizontal and vertical position of each resonant probe, using a calibrated vector network analyzer (VNA), and saved in a calibration data file; said calibration includes five steps, step 1 consisting of measuring S-parameters of the tuner as a function of the position of probe 1, probes 2 and 3 being initialized, step 2 consisting of measuring S-parameters of the tuner as a function of the position of probe 2, probes 1 and 3 being initialized, step 3 consisting of measuring S-parameters of the tuner as a function of the position of probe 3, probes 1 and 2 being initialized, step 4 consisting of cascading the S-parameters measured in steps 2 and 3 with the inverse S-parameters of the tuner, measured when all probes are initialized, and step 5 consisting of saving the S-parameters collected and calculated in steps 1 to 4 in a total of 9 calibration data files, one for each of 3 probes and each of 3 harmonic frequencies.

3. Argument versus Claim Rejections – 35 USC § 102

The Examiner argues that Kiyokawa discloses a tuner apparatus, which includes a resonant probe, as per figures 14a and 14b below. As it can be seen from the following parts of Kiyokawa's specification, column 1, lines 60ff and column 2, lines 0-20, here Kiyokawa is not describing his invention; instead here he describes prior art; Kiyokawa's figure 14 a, b corresponds to our figure 5-prior art (see below as well); albeit Kiyokawa's drawing of a vertical probe in figure 14a is inaccurate regarding the shape of the bottom of the probe: Kiyokawa's probe will not generate a controllable high reflection factor, as claimed by him in column 2, lines 0-20. This is, however, not the core of the argument here.

Kiyokawa,
column 1,
lines 60ff

Describes
Prior Art

input/output signal levels, impedance matching is performed, to optimize output power and gain, etc.

FIG. 14 shows a configuration of a typical coaxial mechanical tuner, called a slug tuner. This is configured as a slabline, with a center conductor 106 arranged at a central position between a pair of parallel, opposed ground planes 105a and 105b. FIG. 14(a) shows a cross section perpendicular to the slabline, and FIG. 14(b) shows a cross section parallel to the slabline. With a metallic slug 107 inserted down into the slabline, arbitrary impedances are generated

Kiyokawa,
column 2,
lines 0-20

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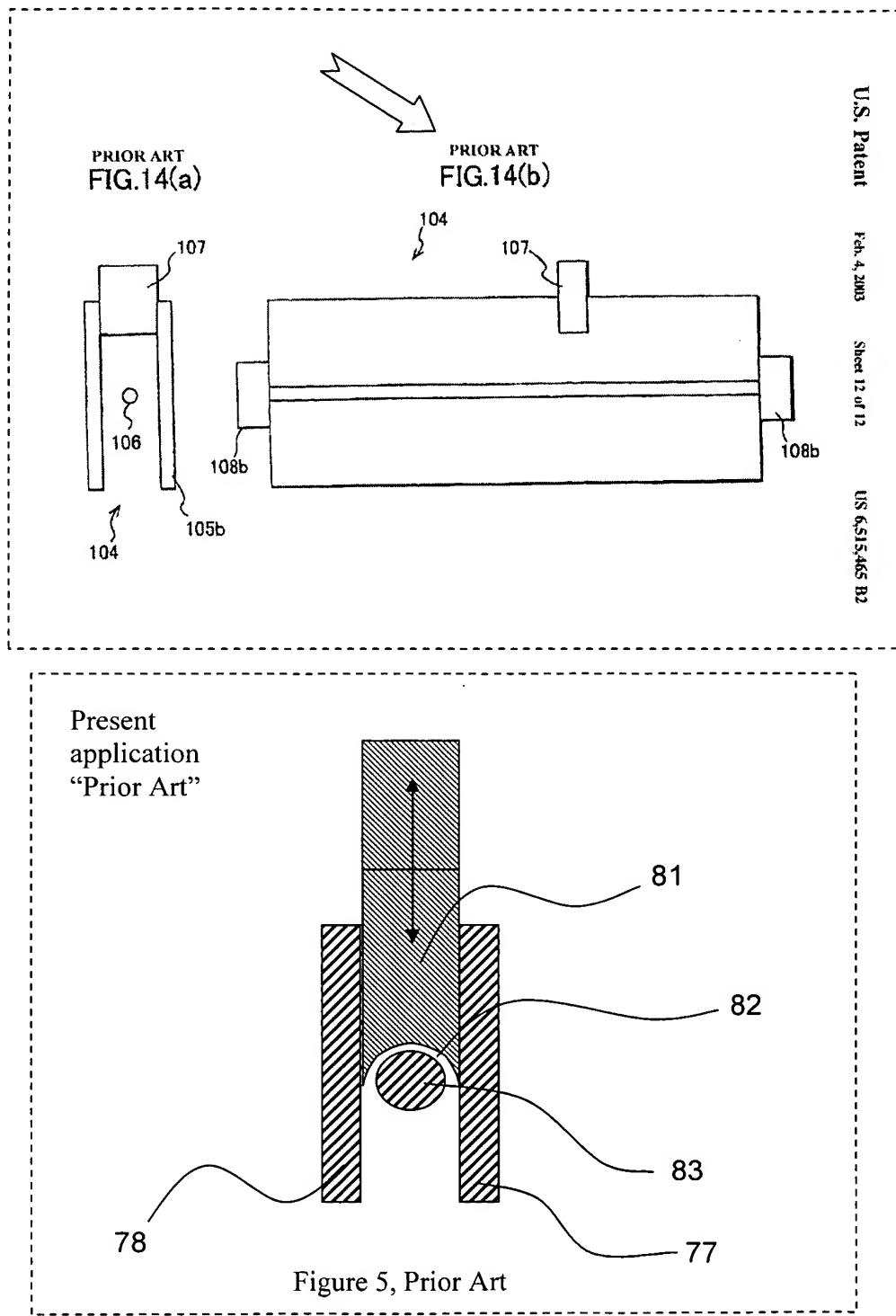
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by adjusting the position of the slug 107 horizontally and vertically with respect to the slabline. Signals are input to the tuner via an input coaxial terminal 108a, and are output via an output coaxial terminal 108b.

The electrical angle from the output terminal of the DUT 101 is varied by adjusting the horizontal distance from the input terminal 108a to the slug 107. The absolute value of the reflection coefficient corresponding to the load impedance observed from the output terminal of the DUT 101 is varied by adjusting the vertical distance from the center conductor 106 to the slug 107. A short-circuit condition (reflection coefficient absolute value of 1) is effected by bringing the slug 107 into proximity of the center conductor 106; conversely, by increasing the distance between the slug 107 and the center conductor 106, it is possible to minimize the effect on the electromagnetic field of the transmission line, enabling an impedance of 50 ohms (reflection coefficient absolute value of 0). Since a DUT cannot normally be accessed directly from a coaxial component, a transforming structure is necessary. There are a number of access means, with the transforming structures being referred to as test fixtures.



Further on, the Examiner's argument that a three-section tuner can be anticipated based on Tsironis' patent No 6,297,649, does not apply here, because the argument is based on the wrong assumption that the probes described here by Kiyokawa (which are not

resonant), are of the same nature as the probes claimed in this application (which are resonant).

4. Argument versus Claim Rejections – 35 USC § 103

The Examiner argues that the resonators described by Kiyokawa in his patent (not the probes described as prior art above) are the same as in the present application. This is not true. Kiyokawa's resonant probes are contacting probes, of the same nature as Tsironis' resonant probes (US patent No 6,297,649); the only difference being that Tsironis' probes are open stubs $\lambda/4$ long at the harmonic frequencies ($2f_0$ and $3f_0$), whereas Kiyokawa's probes are $\lambda/4$ long at the fundamental frequency (f_0), because Kiyokawa intends to suppress the fundamental frequency, whereas Tsironis intends to suppress the harmonic frequencies. Both apparatus, Tsironis' and Kiyokawa's are in principle mechanically identical, with the sole difference being the length of the stabs of the probes. In both cases the stabs are making galvanic contact on one end with the central conductor of the slabline, as described by Kiyokawa in column 11, lines 16-20 and cited by the Examiner.

Kiyokawa, Column
11, lines 15-20

Contact is
maintained
between open
stab and center
conductor

stabilized sliding motion of the slug probes.

FIG. 12 shows a slide-guide arrangement provided on a load tuner 41 that has an open-ended stub probe 50. Each of the parallel ground conductor plates 51b of open-ended stub probe 50' is provided with a through-hole 51c, support members 8 are provided at each end of the pair of parallel ground conductor plates 41a, and guide rails 9 are inserted through the through-holes 51c. This enables the open-ended stub probe 50' to be slid along the ground conductor plates 41a while contact is maintained between the center conductor 53 of the open-ended stub probe 50 and the center conductor 41b of the slabline.

The support members 8 can be formed of aluminum, for

It is therefore obvious that the open stabs in Kiyokawa's resonant probes are contacting the center conductor of the slabline, while our application claims resonant probes with open stabs which are not-contacting the center conductor of the slabline.

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In summary: Prior art and this application deal with three types of probes:

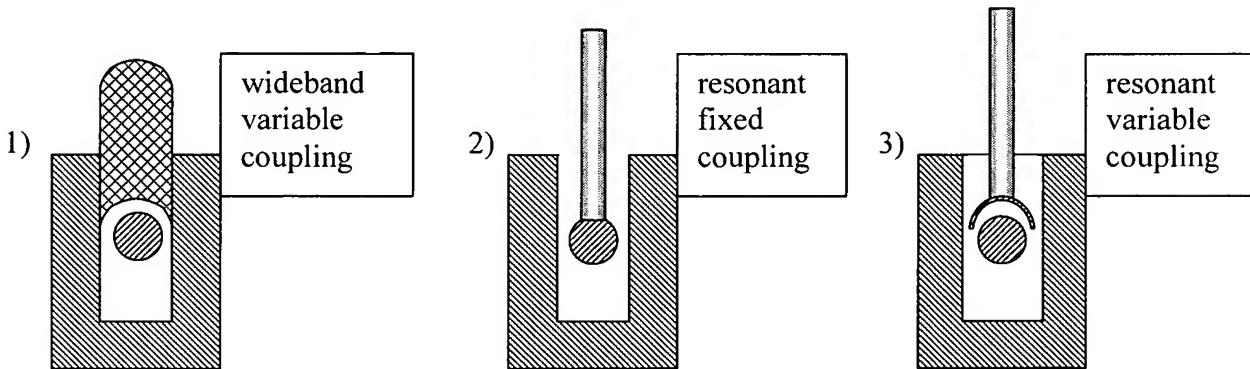
a) Prior Art

1. Wideband probes, which contact the sidewalls of the slabline, but not the center conductor of the airline.
2. Resonant coaxial probes (narrow-band), of which the center conductor does contact the center conductor of the airline.

b) New Claim (this application)

3. Resonant coaxial probes (narrow band), of which the center conductor does not contact the center conductor of the airline.

The RF behavior and adjustability of the three probes is fundamentally different and there is no obvious way to conclude from one to the other.



Prior Art (Tsironis et al.)

Prior Art (Tsironis & Kiyokawa)

New (this application)

5. Amended Figures

Figure 6 was not marked "Prior Art", even though it shows prior art.

This is corrected hereby.

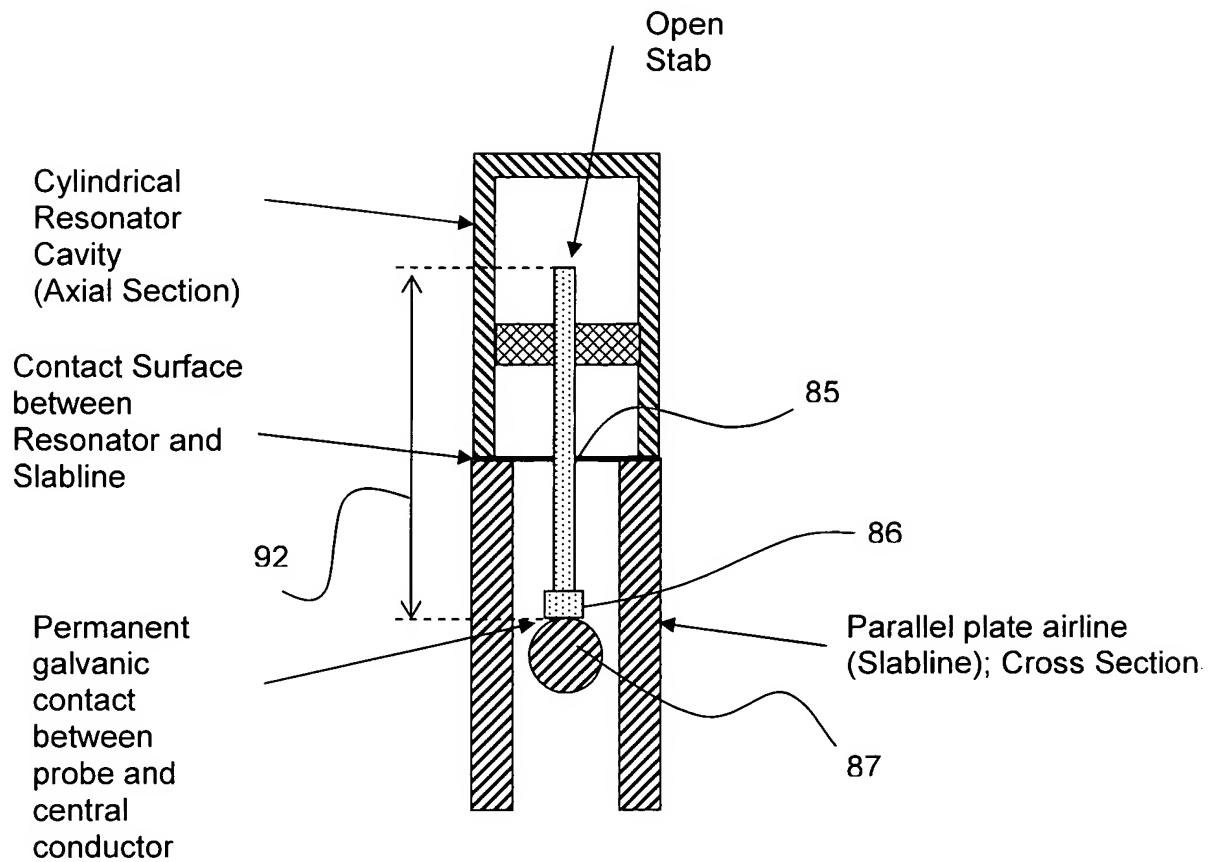


Figure 6 – Prior Art

Appendix – Copies of articles in IDS

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Substitute for form 1449 RTO

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